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(54) **BIOPRESENCE BASED KEYGUARD MECHANISM**

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(51) **Int. Cl.**
H04Q 9/00 (2006.01)

(52) **U.S. Cl.** **340/5.52**; 455/411

(58) **Field of Classification Search** 340/5.52
See application file for complete search history.

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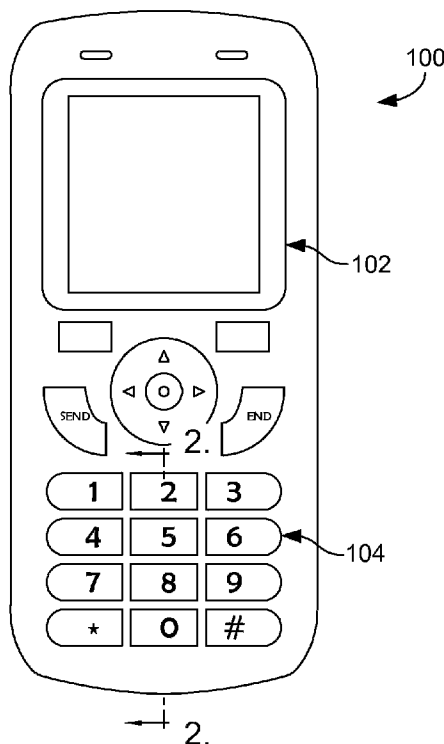
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(57) **ABSTRACT**

A keyguard mechanism protects against situations where unintentional touch on a device keypad, by a person or by an inanimate object, unlocks the keypad. A bio-presence based keyguard mechanism for a portable device detects a situation where both a bio-presence sensor and a pressure or displacement sensor are engaged, and then selectively removes an associated keypad from a locked state and places the keypad in an unlocked state. A signal is received from a pressure or displacement sensor associated with a particular key of the keypad, when the keypad is in a locked state. It is then determined whether a signal is received from a bio-presence sensor associated with the particular key, or with a particular portion of the keypad, within an allotted time period, and if so, the status of the keypad is changed to an unlocked state.

8 Claims, 2 Drawing Sheets



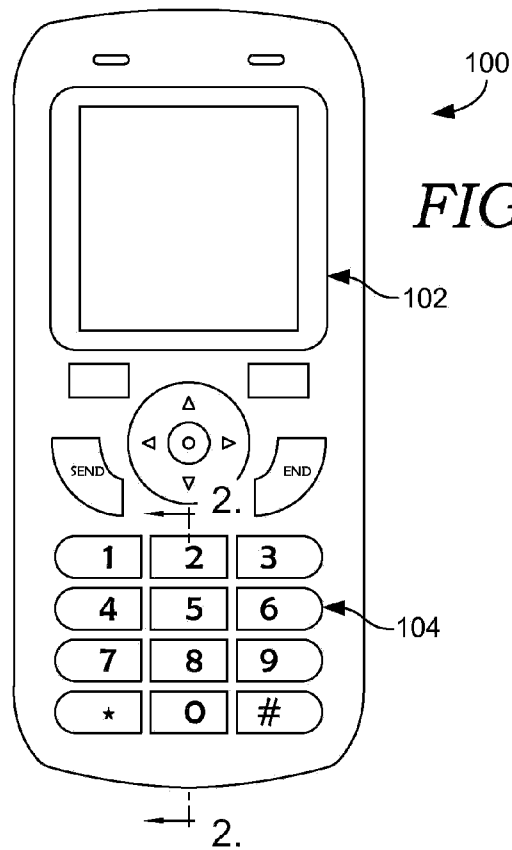


FIG. 1.

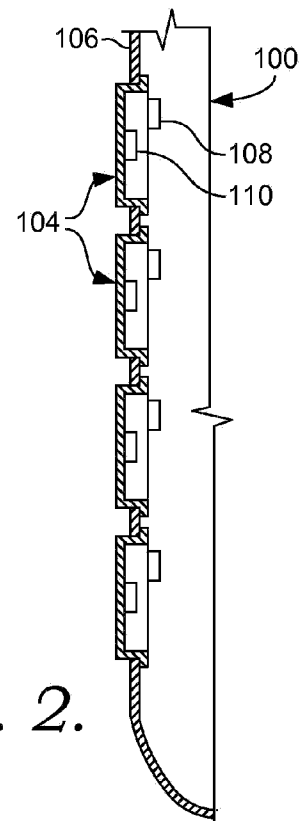
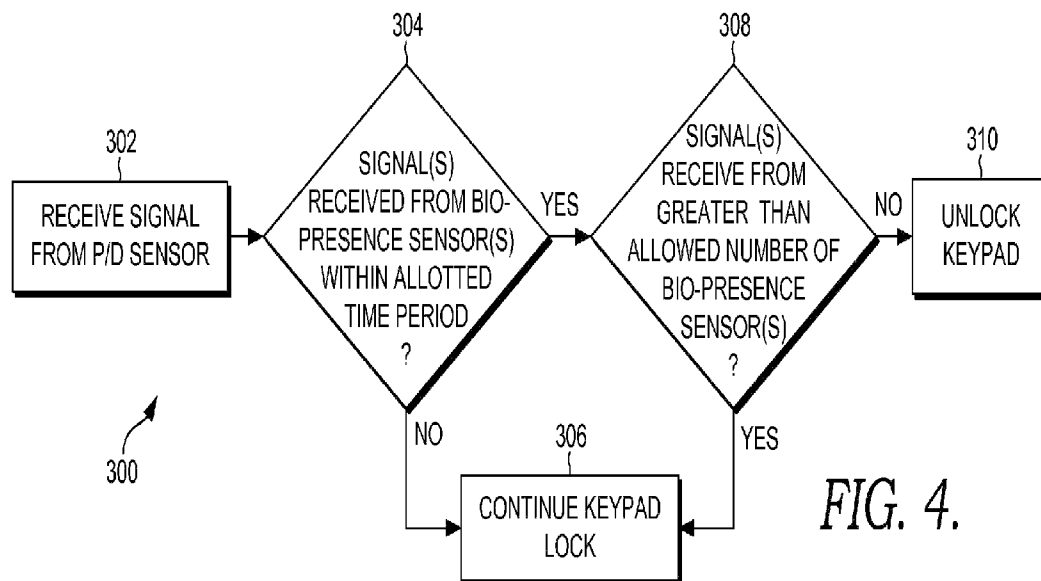
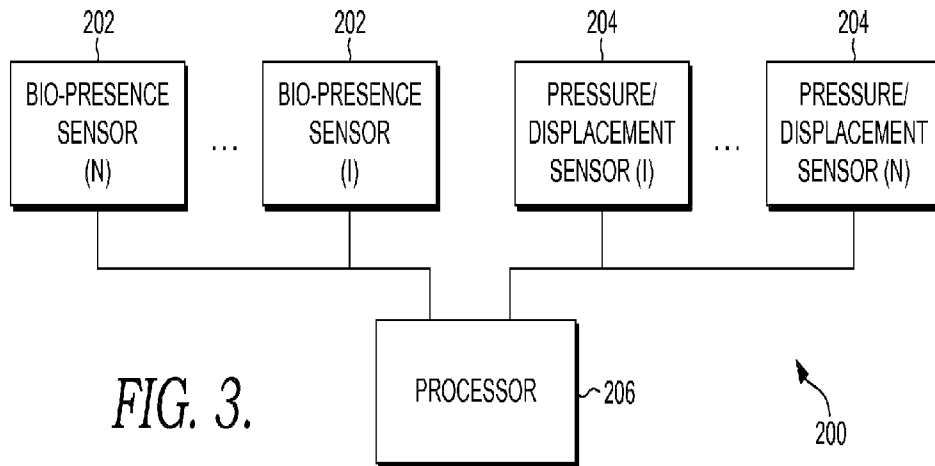


FIG. 2.



**BIOPRESENCE BASED KEYGUARD
MECHANISM****CROSS-REFERENCE TO RELATED
APPLICATIONS**

This application is a continuation of U.S. application No. 11/756,836, filed Jun. 1, 2007, titled "BIOPRESENCE BASED KEYGUARD MECHANISM," and which is herein incorporated by reference.

SUMMARY

The present invention is defined by the claims below. Some embodiments of the present invention provide a keyguard mechanism for a portable device that is bio-presence based. In some embodiments, the keyguard mechanism detects a situation where both a bio-presence sensor and a pressure or displacement sensor are engaged, and then selectively removes an associated keypad from a "locked" state, in which the keypad is actually disabled or simply ignores certain key presses, and places the keypad in an "unlocked" state, in which the keypad is enabled and can be used to perform normal input functions. The keyguard mechanism protects against situations where unintentional touching by a person of the keypad, or keypad contact by an inanimate object, "unlocks" the keypad.

In one aspect, the keyguard mechanism includes a set of key sensors associated with keys of a device keypad, where each of the key sensors is either, or both, a pressure sensor or a displacement sensor. The keyguard mechanism also includes biopresence sensors associated with keys of the device keypad and configured to register a condition associated with human touch on the device keypad. The keyguard mechanism further includes a processor for processing signals generated by the key sensors and the bio-presence sensors to determine that an unlocked state for the device keypad is warranted, where the unlocked state is warranted when a key sensor detects an engagement of the device keypad, a bio-presence sensor detects the same engagement of the device keypad, and a time period measured from when the engagement of the device keypad is detected by the key sensor, to when the same engagement of the device keypad is detected by the bio-presence sensor, is less than an allotted time period.

**BRIEF DESCRIPTION OF THE SEVERAL
VIEWS OF THE DRAWINGS**

Illustrative embodiments of the present invention are described in detail below with reference to the attached drawing figures, which are incorporated by reference herein and wherein:

FIG. 1 is a schematic view of an exemplary mobile phone in which the keyguard mechanism is implemented;

FIG. 2 is a sectional view taken along line 2-2 of FIG. 1 showing the sensors associated with the keyguard mechanism and located within the exemplary mobile phone in accordance with an embodiment of the present invention;

FIG. 3 is a block diagram representative of functional components of the keyguard mechanism in accordance with an embodiment of the present invention; and

FIG. 4 is a flow chart depicting a method for transforming the status of a portable device keypad from a locked state to an unlocked state in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION

The subject matter of the present invention is described with specificity herein to meet statutory requirements. However, the description itself is not intended to limit the scope of this patent. Rather, the inventors have contemplated that the claimed subject matter might also be embodied in other ways, to include different steps or combinations of steps similar to the ones described in this document, in conjunction with other present or future technologies. Moreover, although the terms "step" and/or "block" may be used herein to connote different components of methods employed, the terms should not be interpreted as implying any particular order among or between various steps herein disclosed unless and except when the order of individual steps is explicitly described.

Some embodiments of the present invention provide systems and methods for biopresence-based keyguard functionality. Specifically, in some embodiments, a keyguard mechanism detects a situation where both a bio-presence sensor and a pressure or displacement sensor are engaged, and then selectively removes an associated keypad from a "locked" state and places the keypad in an "unlocked" state. This reduces the chance that a keypad is unlocked through unintentional touching by a person or by an inanimate object. By sensing a biologically-based condition typically associated with touch by a human finger beyond mere displacement of a key on a keypad (e.g., via registering electrical conductivity, body heat, etc.), the opportunity for keypad engagement by unintentional touching by a person, or by an inanimate object, is reduced. This is especially beneficial for mobile phones and other portable electronic devices with external keys, which are often accidentally engaged when a user has the device in the pocket and is in movement. Because many portable devices are in "hibernate" or "power down" state when the keypad hasn't been engaged for a certain time period, accidental key engagement accelerates the draining of the device battery. It should also be understood that descriptions of device keypads as being "enabled" or "disabled" are not limited to keypads being in a fully or completely enabled or disabled state. For instance, a keypad may be considered "locked" and disabled, but some functions on the device may still be accomplished through engaging the keys of the keypad (e.g., making a 9-1-1 emergency call, in situations where unlocking the keypad also requires a particular password to be entered). Additionally, it should be understood that a "locked" keypad may refer to a certain grouping of keys on a keypad being disabled, or ignoring certain pressing of such keys until a biosensor senses a required touching. For instance, the alphanumeric portion of keys on a mobile device may be in a locked or unlocked state, regardless of the state of other keys on the mobile device. Alternatively, all input keys on a device may be considered "locked" or "unlocked" together, according to the configuration of the particular mobile device.

As one skilled in the art will appreciate, embodiments of the present invention may be embodied as, among other things: a method, system, or computer-program product. Accordingly, the embodiments may take the form of a hardware embodiment, a software embodiment, or an embodiment combining software and hardware.

Computer-readable media include both volatile and non-volatile media, removable and nonremovable media, and computer-readable media readable by a database, a switch, and various other devices. By way of example, and not limitation, computer-readable media comprise media implemented in any method or technology for storing information. Examples of stored information include computer-useable instructions,

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data structures, program modules, and other data representations. Media examples include, but are not limited to information-delivery media, RAM, ROM, EEPROM, flash memory or other memory technology, as well as magnetic storage devices or any other type of electronic storage device. These technologies can store data momentarily, temporarily, or permanently.

Turning now to FIGS. 1 and 2, and exemplary portable device, in the form of a mobile phone 100, is depicted as an environment in which a biopresence-based keyguard mechanism of the present invention is implemented. The terms “portable device”, “mobile device”, and “electronic device” are used interchangeable herein and refer generally to the same type of device, which includes, without limitation, mobile phones and other portable electronic devices and communication devices.

The device 100 includes a keypad 104 and a display screen 106. Numerous other keys may be positioned on different surfaces of the device 100 away from a primary keypad 104, as is known with conventional mobile phones 100 and other portable electronic devices. For the purposes of this disclosure, the keypad 104 encompasses any keys that may be engaged by a user anywhere on a device, such as mobile phone 100.

The keypad 104 is formed to face outwardly from a frame 106 of the mobile phone 100, enabling a user to readily engage the keypad 104. A conventional keypad 104 employs pressure or displacement sensors 108 associated with particular keys, to capture the input provided by the user. In the present invention, a set of bio-presence sensors 110 are preferably mounted with individual keys of the keypad 104. The bio-presence sensors 110 may be of any type of sensor that detects human touch, such as heat sensors, electrical conductivity measuring sensors, ultrasound sensors, or other sensors.

With additional reference to FIG. 3, a set of functional components 200 of the biopresence-based keyguard mechanism residing within the mobile phone 100 are depicted. One bio-presence sensor 202 (corresponding to sensor 110 of FIG. 2) may be associated with each key of the keypad 104, or may be associated with a region or portion of the keypad 104, with each pressure/displacement sensor 204 (corresponding to sensor 108 of FIG. 2) associated with an individual key. Signals generated by the sensors 202 and 204 are processed by a processor 206, which may be a main processor of the mobile phone 100 or a separate processor (e.g., a microprocessor having associated memory and applications, or an application specific integrated circuit). The processor 206 thereby determines whether to change the status of the keypad 104 from a “locked” condition to an “unlocked” condition.

The bio-presence sensors 202 may be calibrated to generate a signal based on a certain “profile” generally accepted as being representative of a person’s finger touching the keypad 104 or an individual key thereof. For instance, if a heat sensor measures a certain temperature, or a temperature of one particular heat sensors is measured as higher than other heat sensors of the keypad 104, the processor 206 takes the signal generated by the sensor or sensors and determines when the signals are representative of displacement of a key and simultaneous touching by a human finger. Likewise, the sensors 202 may respond to a particular electrical conductivity profile associated with touch by a user’s finger, and if a threshold conductivity value is reached, or is measured within a particular range of values, a signal is generated and transmitted to the processor 206. The sensors 202 may be configured to generate signals based on direct human touch on the keypad, or touch through a thin object, such as glove liners or the like. As one of skill in the art can appreciate, the sensitivity of the

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bio-presence sensors 202 implemented in the present invention affect when a human touch condition is registered. Preferably, the sensors 202 are configured to avoid a situation where, for instance, a user’s skin through their pants leg is sensed as a human touch condition (e.g., by registering heat or electrical conductivity of the skin). In another embodiment, if the sensors 202 are not calibrated to distinguish such a “touch” or proximity to skin condition (or if the processor 206 is incapable of making such a distinction based on the signals received from the sensors 202), the processor 206 may examine whether multiple bio-presence sensors 202 are generating touch-registering signals either simultaneously, or within a close proximity in time to one another. Such a condition would indicate touching of multiple keys on the keypad 104 at once, generally corresponding to accidental engagement of the keypad 104, such as by a user’s leg or torso when the device is in the pocket of an article of clothing. Alternately, a condition sensed by multiple bio-presence sensors 202 where a pre-established set of two or more keys are simultaneously depressed may not be accidental, but purposeful key engagement, allowing for unlocking of the keypad. For instance, if only a pair of keys spaced from one another across a keypad are sensed to be depressed, and this combination key press was preprogrammed into the portable device (e.g., by the manufacturer or the end user), the such a key depression situation may be logged as an intentional key press in terms of unlocking the keypad. Additionally, as referenced above, in an alternative embodiment, each key of a keypad 104 may not have an associated bio-presence sensor 202, so that human touch registering is merely conducted within a certain region of a keypad 104 or on selective keys.

One exemplary method 300 for transforming the status of a portable device keypad from a locked state to an unlocked state, is depicted in FIG. 4. As referenced above, it should be understood that a “locked” keypad state is not limited to keys being fully disabled, but also includes key having limited functionality in the locked state, or merely that key presses are ignored until an unlocked state is reached.

In accordance with the method 300, in step 302, a signal is received by the processor 206 from a pressure/displacement sensor 204 associated with an individual key, or particular region, of the keypad 104, when the keypad 104 is in the locked state. It is then determined, in step 304, whether one or more signals are received from one or more bio-presence sensors 202 associated with the individual key (or keypad region) within an allotted time period measured from when the pressure/displacement sensor 204 signal is received. The allotted time period can be as short as requiring that the signals be received essentially at the same time, or within a brief amount of time since bio-presence sensors may take longer to sense the condition of human touch than a traditional pressure/displacement sensor. The keypad 104 remains in a locked state, in step 306, when the signals from the one or more bio-presence sensors 202 are not received by the processor 206 within the allotted time period. Alternatively, in step 308, an optional determination is made as to whether signals are received from multiple bio-presence sensors 202 (or above a set number of sensors 202, or a group of sensors 202 that are not associated with a preestablished “unlocking” grouping of key depressions) within the allotted time period of step 304, which likely indicates unintentional touching on the keypad 104. If such a multiple bio-presence sensor 202 engagement condition is realized, then the method moves to step 306 where the keypad 104 remains in a locked state. On the other hand, if signals are only received from one bio-presence sensor 202 (or a sufficiently small number of sensors 202) associated with the particular pressure/displacement

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sensor **204** engaged in step **302**, then the status of the keypad **104** is changed to an unlocked state, in step **310**.

Many different arrangements of the various components depicted, as well as components not shown, are possible without departing from the spirit and scope of the present invention. Embodiments of the present invention have been described with the intent to be illustrative rather than restrictive.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations and are contemplated within the scope of the claims. Not all steps listed in the various figures need be carried out in the specific order described.

What is claimed is:

1. A bio-presence based keyguard mechanism, comprising: a set of key sensors associated with keys of a device keypad, wherein each of the key sensors is one or more of a pressure sensor or displacement sensor for detecting engagement of the device keypad through pressure or displacement sensing;
one or more bio-presence sensors associated with one or more of the keys of the device keypad and configured to register a condition associated with human touch on the device keypad; and
a processor for processing signals generated by the key sensors and the one or more bio-presence sensors to determine that changing from a locked state to an unlocked state for the device keypad is warranted, wherein the unlocked state is warranted when

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(1) a key sensor detects an engagement of the device keypad,

(2) a bio-presence sensor detects the same engagement of the device keypad, and

(3) a time period measured from when the engagement of the device keypad is detected by the key sensor, to when the same engagement of the device keypad is detected by the bio-presence sensor, is less than an allotted time period.

2. The mechanism of claim 1, wherein the one or more bio-presence sensors are heat sensors.

3. The mechanism of claim 1, wherein the one or more second bio-presence sensors are electrical conductivity sensors.

4. The mechanism of claim 1, wherein the engagement of the device keypad includes engagement of a pre-established set of two or more keys that are simultaneously depressed.

5. The mechanism of claim 1, wherein the engagement of the device keypad is an engagement of less than a preestablished number of individual keys of the device keypad.

6. The mechanism of claim 1, wherein the engagement of the device keypad is an engagement of less than a preestablished number of individual keys of the device keypad within a preestablished period of time.

7. The mechanism of claim 1, wherein the engagement of the device keypad is an engagement of a single individual key of the device keypad.

8. The mechanism of claim 1, wherein a biosensor is associated with one or more of the keys of the device keypad by association with a region of the device keypad.

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